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AUTHOR Moughamian, Henry
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ABSTRACT

The focus of this project was to determine the relevance of the computer to the academic disciplines of business, mathematics, physics, chemistry, economics, biology, and engineering and to subsequently write computer programs that would provide students with an additional learning tool. Over two hundred programs were written, catalogued into a library by subject, and made available to all faculty. That list is presented. Also included is the report of the users for each discipline and a description of the curriculum development for inclusion of the computer programs in each. Some pages may reproduce illegibly due to poor copy.
(Author/JG)

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COOPERATIVE VENTURE
IN
COLLEGE CURRICULUM DEVELOPMENT

NSF Grant
GJ 282

Principal Investigators Report

Henry Moughamian
May 1, 1970

SE 012 447

I Characteristics of the Participating Institutions

City Colleges of Chicago

City Colleges of Chicago, founded in 1911, comprise a public, urban community college system. They are open-door educational institutions of higher learning which provide services needed by individuals and the community.

The City Colleges of Chicago, which are accredited by the North Central Association of Colleges and Secondary Schools, offer more than a hundred programs and other learning opportunities designed for the individual.

Many kinds of students with different motivations and objectives are blended within the City Colleges of Chicago, one of the largest community colleges in the nation. It has a full-time faculty of 1,100, a student body of 36,000, and has plans for new campuses to serve the educational needs of 100,000 persons by the late 1970's. Its student body is composed mostly of residents of the city of Chicago.

In this atmosphere of learning, four major areas of educational progress are offered:

1. City Colleges of Chicago provide two years of higher education which may lead to the Associate in Arts Degree or Diploma and enable a student to attend a senior institution and earn additional degrees.

2. City Colleges of Chicago provide a student with up to two years of specialized education which may lead to an Associate in Applied Science Degree or Certificate and prepare him for immediate employment.

3. City Colleges of Chicago provide background courses of study for the student who needs to increase his skills and knowledge for college work as the initial step in boosting his educational and employment opportunities.

4. City Colleges of Chicago provide a person with an opportunity to update and upgrade himself in a program offering community services and adult and continuing education.

The participating colleges include Southeast College (2,100 students F.T.E.), Kennedy-King College (2,900 students F.T.E.), and Amundsen-Mayfair College (2,075 students F.T.E.). Of the 36,242 total students enrolled in the Fall, 1969, semester, more than half are in the evening programs. Full time equivalency of 36,242 students is 20,947.

The City Colleges of Chicago are continually striving to improve their instructional programs. Provision for innovative opportunities has been, and will continue to be, provided to CCC faculty in the attempt to maximize learning. Before the present NSF grant, the CCC computer in the educational area was used exclusively for data processing education, e.e., for the training of operators and programmers. Generally, the only experienced faculty in data processing were those faculty members teaching data processing courses to students. Even though experimentation in computer assisted instruction and problem solving by computer were goals of the City Colleges of Chicago, prior to this NSF grant, significant experience was non-existent. The desire to utilize the computer in learning led

to our participation with I.I.T. It was felt that this experience would provide us with the necessary facts upon which to make a future decision regarding the continuation of this curriculum development in the City Colleges of Chicago.

Presently there are some 1100 full-time and 120 part-time faculty members. Project participating faculty members represent three major academic disciplines: Business, Mathematics, and Physics. Since it would take several pages to list the number of courses offered by discipline, we are including a copy of the 1969-1970 Catalog of the City Colleges of Chicago which lists courses offered by academic discipline. As a two-year community college, students do not seek "majors" or degrees by discipline.

II

			<u>Yearly Estimate</u>
3B	(1)	Teletypewriter, ASR 33 (3)	
		Data Set (3)	\$4,140
	(2)	Communication Costs	3,960
C		Real Cost estimated	
		Teletypewriter, ASR 33	
		Data Set	4,140
		Communication Costs	3,600
D		Amundsen/Mayfair	75%*
		Kennedy-King	50%*
		Southeast	50%*

*The utilization time was considerably less during the Spring 1970 semester due to the fact that the 1108 computer was not totally accessible.

III

1

Courses Serviced by Regional

Computing Activity

College Algebra
Calculus I
Calculus II
Statistics
Computer Mathematics

The program library was used exclusively in courses other than primarily programming courses. One of the primary aims of using the computer was to allow the student a new experience. This experience cannot be underestimated. Each of the library programs was introduced to coincide with a classroom topic and was integrated as part of the course.

REGIONAL COMPUTING ACTIVITIES
REPORT OF USED CHARACTERISTICS

INSTITUTION AND ADDRESS		REGIONAL CENTER		PROJECT DIRECTOR/COORDINATOR		GRANT NUMBER	
Southeast College 8600 South Anthony Ave. Chicago, Ill. 60617		Illinois Institute of Technology		Dr. Henry Moughamian		GJ 282	
				REPORTING PERIOD 1969-1970		DATE OF THIS REPORT May 1, 1970	
				NO. OF TERMS IN ACADEMIC YEAR 2			

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

COLLEGE/UNIVERSITY: ☒ INDIVIDUAL ☐ SUMMARY
SECONDARY SCHOOL: ☐ INDIVIDUAL ☐ SUMMARY

(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE			(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY			(4) NUMBER OF FACULTY MEMBERS		(5) NUMBER OF RUNS	(7) CPU Time in Hours	(10) USE IN INSTRUCTION				
											Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Prgs. and Language Development	
	Secondary School	College	Lower Division	Upper Division	Lower Division	Upper Division	Number in Discipline	Number in Regional Act.							
Programming															
Computer Science															
Mathematical and Physical Science		2600			42		15	3	100	100	1.1	.9	60	40	
Biological Science															
Social Science and Education															
Business															
Arts and Humanities															
Engineering, Forestry, and Agriculture															
Unstructured															

IV Curriculum Development

Prior to the initiation of the regional project the department of mathematics at Southeast College was void of any computer or calculator concepts. During the past academic year the computer and the electric calculator have been a part of several courses. These courses were instructed not only by the participants of the regional project but also by several other faculty members. Plans are being made for the next academic year to broaden the areas and courses involving computer and electric calculators.

Program Library (FORTRAN)

Ordered pairs for linear functions ($Y = SX + B$)
Ordered pairs for quadratic functions ($Y = AX^2 + BX + C$)
Evaluation of two by two determinants
Evaluation of three by three determinants
Solution of two linear equations with two unknowns
Solution of three linear equations with three unknowns
Solution of second degree polynomials ($AX^2 + BX + C = 0$)

Complete definition of the elements of a triangle given
(1) three sides, (2) any two sides and their included angle or (3) any combination of two angles and a side
Ordered pairs for parametric equations

Determine the area of a triangle, given three points

Sum of "N" real numbers
Sum and mean of "N" real numbers
Sum, mean, and standard deviation of "N" real numbers
Coefficient of correlation and slope of regression line
for "N" ordered pairs (x, y)

Partial sums and terms of an arithmetic series

Partial sums and terms of a geometric series

Graphing of some trigonometric functions

Ordered pairs for trigonometric functions

Ordered pairs for parametric equations

Solution of "N" problems of the distance between two points

V Problem Areas

The non-availability of the computer. The inaccessibility of teletypes. If these two main obstacles were removed then the computer and computer concepts would be able to play an important and fundamental part in the learning process.

Significant Successes

The development of a starter program library which should grow and may play a fundamental part in interesting other faculty members. The stir of interest shown by other faculty members. The coming use of the City Colleges of Chicago computer in many new areas. The coming faculty awareness of other electronic devices or aids in the educational process.

Special Development

The introduction of a computer mathematics course. The use of computers and electronic calculators in the teaching of technical and vocational mathematics. The shift of emphasis in classroom and homework. This is very marked in the study of statistics.

Noteworthy Cooperative Activities

The time and energy spent by the City Colleges of Chicago in the attempt to extend to all eight campuses the ideas and directions gained by four participating members.

III

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Courses Serviced by Regional Computing Activity

General Physics 231 - Mechanics and Wave Motion

Physics 235 - Engineering Physics I -
Mechanics and Wave Motion

NATIONAL SCIENCE FOUNDATION
OFFICE OF COMPUTING ACTIVITIES
Washington, D. C. 20550

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

Budget Bureau No. 99-100256
Approval Expires 5/31/72

INSTITUTION AND ADDRESS Kennedy-King College 7047 S. Stewart Avenue Chicago, Illinois 60621		REGIONAL CENTER Illinois Institute of Technology		PROJECT DIRECTOR/COORDINATOR Dr. Henry Moughamian		GRANT NUMBER GJ 282	
		REPORTING PERIOD 1969-1970		NO. OF TERMS IN ACADEMIC YEAR 2		DATE OF THIS REPORT May 1, 1970	

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	Secondary School	College		Secondary School	College		Number in Discipline	Number in Regional Act.	IBM 360	UNIV. 1108	IBM 360	UNIV. 1108	Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
		Lower Division	Upper Division		Lower Division	Upper Division										
11																
Programming																
Computer Science																
Mathematical and Physical Science		50			50		2	2	280	35	3	1/2	100%			
Biological Science																
Social Science and Education																
Business																
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

IV Curriculum Development

Our approach to the use of the computer has been on an overall philosophy that the student should first gain a working ability in a programming language and the use of the terminal. Hence the first two laboratory sessions are designed to get the student personally involved with the programming of two problem sets and the preparation of punched tapes for transmission. The computer output from his tapes is returned to him and he actually operates independently with only advice and guidance from the instructor until his programs have successfully run to completion.

The computer interaction for the remainder of the laboratory sessions then becomes an information processing system for experiments where it is logical to use the computer. Criteria for its use include not only whether many tedious calculations need to be made but whether the application has pedagogical value.

The programs presently developed and in use include:

1. Limit - This program is designed to demonstrate, particularly to students who have not studied calculus, the concept of a mathematical limit. An arbitrary function of position and time is used to show that as the time interval decreases, the numerical value of the ratio of displacement to time approaches a limiting value. The derivative of the function is also taken and compared to the limiting value.

2. Gravitational Acceleration - This program calculates the acceleration of a freely falling body, displacement measurements are made on a tape that has been produced on a conventional spark

timed free fall device. Calculations of the average acceleration in each interval is performed by the computer and tabulated as well. The probable error is calculated and a best fit curve of a second order quadratic equation is made in the least squares sense. The coefficients of the quadratic equation are printed and compared to the theoretical values. The experimental and the best fit curves are then plotted for final comparison by the student.

3. Newton's Second Law - This program calculates the acceleration of a cart on a track accelerated by a hanging mass. Variations are made on the hanging mass keeping the total mass constant. As in the free fall experiment the accelerations are calculated and analyzed.

4. Projectile Motion - The program illustrates the motion of a projectile acted upon by a gravitational force. It provides values for the velocity and position of a projectile as a function of time. The student chooses the initial velocity, angle of projection, time interval between calculations, and the number of calculations. A listing of the projectile position without gravity is also provided.

V Case Studies, etc.

The biggest problem encountered has been the less than fully operational status of the computer during a large fraction of Spring 1970. Whereas in the first (3) weeks in January 1970 we had a personal record of 113 runs on the computer, only a small fraction of this was accomplished thereafter due in a large part to problems with the new computer. The dependable operation of the terminal and the computer is absolutely necessary to maintain student confidence as well as increased faculty participation. This is probably the key to success until the computer input function is vastly improved by future technology.

III

1

Courses Serviced by Regional
Computing Activity

Data Processing 101 - An introduction to
business data processing
offered by Business Dept.

NATIONAL SCIENCE FOUNDATION
OFFICE OF COMPUTING ACTIVITIES
Washington, D. C. 20550

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

Budget Bureau No. 99-100256
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	Secondary School	College		Secondary School	College		Number in Discipline	Number in Regional Act.							
		Lower Division	Upper Division		Lower Division	Upper Division									
Programming															
Computer Science															
Mathematical and Physical Science															
Biological Science															
Social Science and Education															
Business		180			95			11	1	400	10	2½	0	90%	10%
Arts and Humanities															
Engineering, Forestry, and Agriculture															
Unstructured															

IV

(1)

Business Game - A Business simulation model; Econ. (Macro and Micro 1), simulations involving G.N.P. and price theory analysis; Linear Prog. - solves for optimum solution. All programs above are in FORTRAN.

In addition, three programs have been developed which require the student to analyze accounting transactions and process them via the computer. The computer prints a final trial balance, an analysis of all student errors, and a grade for the problem. The basic program will analyze any transaction involving a given chart of accounts. The "grading" subroutine can be interchanged to coincide with a change in the transactions. These programs are in IITRAN.

(2)

Data Processing 101 - 3 sections

(3)

Basically programming; programs listed in (1) above were not used last year.

III

1

Courses Serviced by Regional Computing Activity

Data Processing 101

Business 141 - Business Math

Business 203 - Cost Accounting

Business 101 - Fundamentals of Accounting

Business 111 - Intro. to Business Management

IV Curriculum Development

1. Stored programs: Prepared programs are being utilized in the following areas:

Business Mathematics (Business 141)

Programmed package supplies input/output statements and problem identification. Student supplies the FORTRAN assignment statements used for problem-solving. Written in FORTRAN IV.

Cost Accounting

A package for processing job lot costs interlocked with a general accounting system.

Student input consists of one-line entries each of which represents his analysis of an accounting transaction. The stored program, written in COBOL, provides: Schedules of subsidiary ledgers - A/Receivable, A/Payable, Factory Ledgers, General Ledger Trial Balance, Job Cost Analysis by Job of jobs in process at the beginning and end of the accounting period and of jobs completed. All balances are tested for correct values, errors are asterisked and correct balances indicated.

Fundamentals of Accounting

A package similar to Cost Accounting, without job cost analysis.

Business Game

A simulation in which teams represent businesses competing within an industry and make decisions as to allocation of resources.

Biology

Experimenting with use of FOXRAB, a prey-predator ecology model demonstrating interaction of population curves.

IV 2. Courses utilizing computer facilities (other than for programming)

Introduction to Data Processing (Data Proc. 101)

Use limited to two exercises to demonstrate use of stored data base and to acquaint students with use of teletype terminal and paper tape as input media.

Business Mathematics (Business 141)

Used as problem solving tool.

Cost Accounting (Business 203)

Used to record and summarize transaction analyses.

Fundamentals of Accounting (Business 101)

Used to record and summarize transaction analyses.

Marketing (Business 231)

Introduction to Business Management (Business 111)

Management teams supply decisions on resource allocation to achieve some long-range objective (generally to maximize profits).

Biology 112

Use of ecology model FOXRAB to study population interactions as variables change.

3. Relevance of computer use to academic discipline

Business Mathematics

Programming knowledge required of students is limited to ability to construct a FORTRAN assignment statement. Student decides what mathematical manipulations are necessary to solve a particular problem. The computer is utilized as a tool to perform the mathematical calculations relieving the student of repetitive tasks and freeing his time for attention to more problem solving activity.

The packaged program available to the student in this in this application includes system control instructions and input/output routines.

Cost Accounting

Job lot cost with interlocking general ledger controls.

An extensive exercise, coordinated with the students' accounting text, supplies accounting transactions to be analyzed. The cost accounting has had practice in the recording and summarizing of business transactions in previous accounting course work. This computerized application reduces the amount of clerical work the student performs to record his analysis. Input forms have been designed to permit recording of the student's decision in the form of one-line entries consisting of approximately 12 digits.

A stored computer program is utilized to do the recording and summarizing of transaction. Decision making becomes the task of the accounting student; the clerical tasks are assigned to the computer. Preparation of financial statements is left to the student by this application so that he may learn to handle the accounting related to the manufacturing type of business. The accounting student (not the computer programmer, in this case) needs the practice in preparation of financial statements.

Fundamentals of Accounting

Approach similar to the above utilized. By the time the student is ready for this extended exercise, analyzing transactions coordinated with textbook assignments, he has had an opportunity to have mastered the techniques of recording and summarizing

transactions and can now profitably spend more time on the decisions necessary to transaction analysis. Again, the clerical tasks are assigned to the computer enabling the student to spend more time on transaction analysis.

Marketing Introduction to Business Management

In playing at decision making, in using the Business Game simulation, the student becomes aware of some of the potential assistance which can be rendered by the computer in decision-making. He can begin to realize the need for complete and up-to-date information which should be the basis for his decision making. He can also become aware of the limitations of models and the value of judgment in utilizing what information is available in the making of decisions. Because of the limitations of the model and the "make believe" nature of the game, it is doubtful that skill in decision making is developed.

Biology 112

Use of FOXRAB prey-predator model was in the experimental stages, with more extensive use planned for the second semester. FOXRAB was unavailable on the system during the second semester. Experimentation to this point has been done primarily by classroom professors familiarizing themselves with the model and its use before incorporating this material as part of the regular course content.

It is the intent of this application to permit students to analyze the adequacy of the model, to experiment with changing the variables (birth rate of the prey, birth rate of the predator, death from natural causes, etc.) to observe the interaction of the population curves and to try to make interpretations from the

results observed.

It was not possible to utilize this material sufficiently to evaluate its usefulness nor its acceptance by students.

V Faculty in various disciplines are becoming aware of the potential made available through use of the computer. Meaningful classroom applications cannot develop without handling of two problem areas:

1. Developing of economical, accurate, and rapid input devices readily available to students.
2. Readily available access to a computer (via perhaps terminal communication devices) with a reliable and fairly rapid turnaround time.

Measurement tools and experimental design used in other classroom situations to measure learning can be applied to this area (i.e., control class vs. experimental class). Cannot be meaningful until access becomes routine.

1400ED OK 16/11/65
SINCE SEPT. 1, 1969

COOPERATIVE PROGRAM EXCHANGE SERVICE
PHYSICS INDEX

Number	Name	Type	Author	Language
1	Add Waves	Abstract	Cook&Weinstock	FORTRAN
2	Eigenvalues of 1-Dim Sq. Well	Abstract	Cook&Weinstock	CALCTAN
3	Simple Harmonic Motion	CETU	Irasky	FORTRAN
4	Simple Harmonic Motion	Abstract	Pikell	IITRAN
5	Orbit Analysis	CETU	Irasky	FORTRAN
6	Orbit Analysis	Abstract	Pikell	IITRAN
7	Satellite Velocity and Acceleration	Abstract	Pikell	IITRAN
8	Addendum to Introductory Computer Based Mechanics, Student Manual	Review	Cook&Weinstock	
9	Projectile Motion	Abstract	Akin	IITRAN
10	Limit	Abstract	Akin	IITRAN
11	Gravitational Acceleration	Abstract	Akin	IITRAN
12	Newton's Second Law	Abstract	Akin	IITRAN
13	Add Waves - CALCTAN	Abstract	Cook&Weinstock	CALCTAN
14	Add Waves - IITRAN	Abstract	Cook&Weinstock	IITRAN
15	Radioactive Decay	Abstract	Cook&Weinstock	CALCTAN
16	Fresnel Diffraction	Abstract	Cook&Weinstock	FORTRAN
17	Fraunhofer Diffraction	Abstract	Cook&Weinstock	FORTRAN
18	Average	Abstract	Broshar	IITRAN
19	Propagation of Errors	Abstract	Broshar	IITRAN
20	Least Square Fit of Free-Fall Data	Abstract	Broshar	IITRAN
21	Dice Model of Radioactive Decay Series	CETU	Weinstock	CALCTAN
22	Lunar Landing Simulator	CETU	Venhaus	CALCTAN
23	Data Reduction	Review	Weinstock	
24	Harmonic Motion	Review	Weinstock	BASIC
25	Two Experiments: Conservation of Momentum and Simple Harmonic	Review	Weinstock	FORTRAN
26	Relativistic Two-Body Collisions	Review	Weinstock	FORTRAN
27	A Simulated Accelerator Laboratory	Review	Weinstock	FORTRAN
28	Mass Spectrometer Simulation	Review	Weinstock	FORTRAN
29	Randomness and Radioactive Decay	Review	Weinstock	FORTRAN
30	Ballistics	Review	Weinstock	FORTRAN
31	Opening the Other End	Review	Weinstock	BASIC
32	MOON2: Moon Landing Simulation	Abstract	Dewar	CALCTAN
33	Error Analysis One (ER1)	Abstract	C.L. Wiley	IITRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

CHEMISTRY INDEX

Number	Name	Type	Author	Language
1	QOLS (Qualitative Organic Library Research)	Abstract	Weidenbaum	IITRAN
2	pH of Solutions of Monobasic Acids	Abstract	Weidenbaum	CALCTRAN
3	Correlation Coefficient	Abstract	Weidenbaum	CALCTRAN
4	Least Squares Best Line	Abstract	Weidenbaum	CALCTRAN
5	Total Press (Gas Pressure Van der Waal's Law)	Abstract	Seiders	IITRAN
6	GASVOL (Gas Volume Ideal Law)	Abstract	Stone	IITRAN
7	Light Series	Abstract	Seiders	IITRAN
8	ERGS (Binding Energy)	Abstract	Belke	IITRAN
9	Linear Least Squares (Filecode: LSL, LS2)	Abstract	Reed	IITRAN
10	ORG.ANAL1 (Organic Qualitative Analysis)	Abstract	Gasser&Emmons	IITRAN
11	ORG.ANAL2 (Organic Qualitative Analysis)	Abstract	Gasser&Emmons	IITRAN
12	VAN.DER.PL (Plot of the Van der Waal Model of a Gas)	Abstract	Dougherty	IITRAN
13	GEN.PL. (General Point Plotter)	Abstract	Dougherty	IITRAN
14	TITRATION (Potentiometric Titration Graphs)	Abstract	Dougherty	IITRAN
15	MAXWELL.PLOT (The Maxwell Distribution of Velocities)	Abstract	Dougherty	IITRAN
16	MIAC (The Mean Ionic Activity Coefficient)	Abstract	Dougherty	IITRAN
17	EUTECTIC.PLOT	Abstract	Dougherty	IITRAN
18	H.E.A.S.	Abstract	Pollnow	FOTRAN
19	Theoretical Flame Temperature	Abstract	Pollnow	FOTRAN
20	Simultaneous First Order Differential Equations	Abstract	Pollnow	FOTRAN
21	Least Squared Exponential Clausius-Clapeyron	Abstract	Pollnow	FOTRAN
22	Fraction of Molecules with Energy > E	Abstract	Pollnow	FOTRAN
23	Energy Levels of an Asymmetric Rigid Rotor	Abstract	Pollnow	FOTRAN
24	VOL.CYL.INT (Monte Carlo Integration)	Abstract	Jameson	IITRAN
25	HYD.MOL.ION (H ₂ ⁺ molecule ion)	Abstract	Jameson	IITRAN
26	LIST.ORD (Sorting)	Abstract	Jameson	IITRAN
27	RATEK (Second Order Rate Constant)	Abstract	McCluskey	IITRAN
28	FORATEK (First Order Rate Constant)	Abstract	McCluskey	IITRAN
29	FCONSTANT (Force Constant)	Abstract	McCluskey	IITRAN
30	VDERRD (Solution of Van Der Waal's Equation for Volume)	Abstract	McCluskey	IITRAN
31	A Molecular Orbital Eigenvalue & Eigenvector Program	Abstract	Beineke-Alms	IITRAN
32	General Point Plotter II	Abstract	Dougherty/Reed	IITRAN
33	CURVE IT1	Abstract	Igielski	IITRAN
34	Carbonate-Bicarbonate Analysis	Abstract	Weidenbaum	CALCTRAN
35	TITRE	Abstract	Weidenbaum	IITRAN
36	ENTROPY	Abstract	Igielski	IITRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

GENERAL INDEX

<u>Number</u>	<u>Name</u>	<u>Type</u>	<u>Author</u>	<u>Language</u>
1	Average and Standard Deviation	Abstract	Weidenbaum	CALCTRAN
2	Average and Average Mean Deviation	Abstract	Weidenbaum	CALCTRAN
3	Perpetual Calendar	Abstract	Weidenbaum	CALCTRAN
4	Discriminating Grade Averaging	Abstract	Weidenbaum	CALCTRAN
5	Linear Regression	Abstract	Pikell	IIITRAN
6	Analysis of Variance	Abstract	Pikell	IIITRAN
7	Correlation Coefficient	Abstract	Pikell	IIITRAN
8	Plot Subroutine	Systems Program	IPC staff	FORTRAN
9	Fourier series plotter	Abstract	John Wechter	CALCTRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

BIOLOGY INDEX

<u>er</u>	<u>Name</u>	<u>Type</u>	<u>Author</u>	<u>Language</u>
	GIGO (Statistics Package for Students)	Systems Program	Korster	FORTRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

BUSINESS INDEX ✓

<u>Number</u>	<u>Name</u>	<u>Type</u>	<u>Author</u>	<u>Language</u>
1	Business Math Application	Abstract	Sutherland	FORTRAN
2	Job Lot Cost Accounting	Abstract	Sutherland	COBOL
3	Business Game	Systems Program	Stiff	FORTRAN
4	Keynesian Macroeconomic Model (MACRO 5)	CETU	Graves	FORTRAN
5	MICRO I	CINTU	Graves	FORTRAN
6	Linear Programming Model (LP563)	CETU	Graves	FORTRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

MATHEMATICS INDEX

<u>Name</u>	<u>Type</u>	<u>Author</u>	<u>Language</u>
Series Summation (Filecode: C103)	Abstract	Petosa	IITRAN
Difference Between Means (Filecode: S8.6)	CETU	Petosa	IITRAN
Integration by Simpson's Rule (Filecode: SIMP)	CETU	Driscoll	IITRAN
Plotting Program (Filecode: PLOT.A, PLOT.B)	Abstract	Petosa	IITRAN
Fourth Order Runge-Kutta Method (System of Equation) (RK4S)	Abstract	Driscoll	IITRAN
Fourth Order Runge-Kutta Method (Single First Order Equations) (Filecode: RK4)	Abstract	Driscoll	IITRAN
Difference Between Means (Small Sample) (Filecode: S9.4)	Abstract	Petosa	IITRAN
Frequency Distribution (Filecode: S3.1)	Abstract	Petosa	IITRAN
Difference Between Binomial Parameters (Filecode: S8.8)	CETU	Petosa	IITRAN
Linear Programming (Filecode: FM35)	Abstract	Petosa	IITRAN
Variance Test (Filecode: S9.6)	Abstract	Petosa	IITRAN
Mean and Standard Deviation (Filecode: S3.8)	CETU	Petosa	IITRAN
Paired Difference Test for Small Sample (Filecode: S9.5)	Abstract	Hayes&Petosa	IITRAN
Phenotypic Ratios (Filecode: PHENO)	Abstract	Petosa	IITRAN
Chi Square Test (Filecode: S11.3)	CETU	Petosa	IITRAN
Contingency Tables (Filecode: S11.4)	CETU	Petosa	IITRAN
Integration by Trapezoidal Rule (Filecode: TRAP)	Abstract	Driscoll	IITRAN
Double Integration (Filecode: C102A, C102B)	Abstract	Dorner&Petosa	IITRAN
Gauss Elimination for Solving Linear Equations (C100)	Abstract	Petosa	IITRAN
Tablemaker (Filecode: C14A, C14B)	CETU	Petosa	IITRAN
Evaluation of "N" 2 x 2 Determinants	CETU	Patricelli	FORTRAN
Evaluation of "N" 3 x 3 Determinants	CETU	Patricelli	FORTRAN
Solution of "N" Problems of the Form Two Linear Equations in Two Unknowns	CETU	Patricelli	FORTRAN
Ordered Pairs for "N" Linear Functions in the Form $Y=AX+B$	CETU	Patricelli	FORTRAN
Ordered Pairs for "N" Quadratic Functions in the Form $Y=AX^2+BX+C$	CETU	Patricelli	FORTRAN
Solution of "N" Second Degree Polynomials of the Form $AX^2+BX+C=0$	CETU	Patricelli	FORTRAN
Partial Sums and Terms of an Arithmetic Series	Abstract	Patricelli	FORTRAN
Graphing of Some Trigonometric Functions	Abstract	Patricelli	FORTRAN
Ordered Pairs for Trigonometric Functions	Abstract	Patricelli	FORTRAN
Ordered Pairs for Parametric Equations	Abstract	Patricelli	FORTRAN
Solution of "N" Problems of the Distance Between Two Points	Abstract	Patricelli	FORTRAN
Determine the Area of a Triangle Given Three Points	Abstract	Patricelli	FORTRAN
Systems of Simultaneous Linear Equations	CETU	Chiarulli	IITRAN
Lagrange Interpolation (A)	Abstract	Dentzman	IITRAN

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Name	Type	Author	Language
Lagrange Interpolation (B)	Abstract	Dentzman	IITRAN
Fermat Factorization	Abstract	Bordewick	IITRAN
Fermat Factorization to Primes	Abstract	Bordewick	IITRAN
Function Limit	Abstract	Dentzman	IITRAN
Derivative Definition	Abstract	Dentzman	IITRAN
Polynomial Zeroes	Abstract	Dentzman	IITRAN
Newton-Raphson Polynomial Zeroes	Abstract	Dentzman	IITRAN
Integrals and Derivatives	Abstract	Dentzman	FORTRAN
Systems of Simultaneous Linear Equations	CETU	Chiarulli	IITRAN
Numerical Integration	CETU	Chiarulli	IITRAN
Function Plotter	CETU	Chiarulli	IITRAN
Function Plotter with Automatic Scaling	CETU	Chiarulli	IITRAN
Function and Derivative Plotter	CETU	Chiarulli	IITRAN
Function and Derivative Plotter with Automatic Scaling	CETU	Chiarulli	IITRAN
Numerical Integrations	CETU	Chiarulli	FORTRAN
Matrix Operations	CETU	Chiarulli	IITRAN
Matrix Product	CETU	Dentzman	IITRAN
Limit of Indeterminate Forms	CETU	Dentzman	IITRAN
Linear Systems by Matrix Inversion	CETU	Dentzman	IITRAN
Factorial	CETU	Dentzman	IITRAN
Combinations	CETU	Dentzman	IITRAN
Binomial	CETU	Dentzman	IITRAN
Binomial Series	CETU	Dentzman	IITRAN
Crap Game	CETU	Dentzman	IITRAN
Solid of Revolution-Disc	CETU	Dentzman	IITRAN
Solid of Revolution-Shell	CETU	Dentzman	IITRAN
Riemann Sums-Area	CETU	Dentzman	IITRAN
Taylor Polynomial	CETU	Dentzman	IITRAN
Matrix Inversion	CETU	Dentzman	IITRAN
Digit Translator	CETU	Dentzman	IITRAN
Gauss Elimination	CETU	Dentzman	IITRAN
Triangle Constructions	Systems Program	Venhaus	FORTRAN
Solutions of First Order Initial-Value Problems by the Euler Method	CETU	Chiarulli	IITRAN
Solutions of First Order Initial-Value Problems by the Modified Euler Method	CETU	Chiarulli	IITRAN
Solutions of First Order Initial-Value Problems by the Runge-Kutta Method and Continuing with the Milne Method	CETU	Chiarulli	IITRAN
Subroutine for FORTRAN Free Form Input	Systems Program	Venhaus	FORTRAN
		Failon	IITRAN
		Failon	IITRAN
		Failon	IITRAN
		Venhaus	FORTRAN

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G.C.D. and L.C.M. By Euclid's Algorithm	CETU	Dentzman	IITRAN
DIOPHANTINE EQUATIONS	CETU	Dentzman	IITRAN
SYMBOLIC (Truth Table Maker)	CETU	Vandeveld, S.J.	IITRAN/360
VALIDITY (Logical argument validity checker)	CETU	Vandeveld	IITRAN/360
Curve fittings			
Random number table generator	CETU	Petosa	IITRAN/360
Distribution of Dice Rolls			
Pythagorean triplets			
Mean of a fixed sample on randomly generator population	Abstract	K. Weidenbaum	IITRAN
CIRCLE.DET			

Name	Type	Author	Language
Population Projection (Filecode: IPOPPROJ)	Abstract	Pomes	IITRAN
Makeham's Graduation (Filecode: FMAKEHAM)	Abstract	Pomes	FORTRAN
Reed-Merrell (Filecode: FREEDMER)	Abstract	Pomes	FORTRAN
Logistic Fit to Population Data (Filecode: FLOGSTIC)	Abstract	Pomes	FORTRAN
Population Projection (Filecode: FPOPPROJ)	Abstract	Pomes	IITRAN
Logistic Fit to Population Data (Filecode: ILOGSTIC)	Abstract	Pomes	IITRAN
Makeham's Graduation (Filecode: IMAKEHAM)	Abstract	Pomes	FORTRAN
Sex Ratio (Filecode: FSEXRatio)	Abstract	Pomes	IITRAN
Sex Ratio (Filecode: ISEXRatio)	Abstract	Pomes	IITRAN
Volterra's Phase Trajectory (Filecode: IVOLTERA)	Abstract	Pomes	FORTRAN
Volterra's Phase Trajectory (Filecode: FVOLTERA)	Abstract	Pomes	FORTRAN
Three Man Dominance (Filecode: FDOM)	Abstract	Garside	FORTRAN
Homans' Human Exchange Simulator (Filecode: FHOMSIM)	CETU	Garside	FORTRAN
Index of Dissimilarity (Filecode: FDISSIM)	Abstract	Pomes	FORTRAN
Total Displacement (Filecode: FTOTDISP)	Abstract	Pomes	FORTRAN
Population Doubling (Filecode: FPOPDOB)	Abstract	Garside	IITRAN
Population Doubling (Filecode: IPOPDOB)	Abstract	Garside	FORTRAN
Social Area Analysis (Filecode: FSOCCANAL)	Abstract	Garside	IITRAN
Reed-Merrell (IREEDMER)	Abstract	Pomes	FORTRAN
Births Projection (FBIRTH)	Abstract	Garside	FORTRAN
Kolmogorov-Smirnov One Sample Test (FKOLMO)	Abstract	Pomes	FORTRAN
Kolmogorov-Smirnov Two Sample Test (FKOLM2)	Abstract	Pomes	FORTRAN
Kolmogorov-Smirnov Statistic (FSMIRN)	Abstract	Pomes	FORTRAN
Chi-Square (FCHISQ)	Abstract	Pomes	FORTRAN
Kendall Rank Correlation Coefficient (FKRANK)	Abstract	Pomes	FORTRAN
Wilcoxon Matched-Pairs Signed-Ranks Test (FWPAIR)	Abstract	Pomes	FORTRAN
Cochran Q-Test Statistic (FQTEST)	Abstract	Pomes	FORTRAN
Ranking (FRANK)	Abstract	Pomes	FORTRAN
Sign Test (FSIGNT)	Abstract	Pomes	FORTRAN
Spearman Rank Correlation Coefficient (FSRANK)	Abstract	Pomes	FORTRAN
Correction Factor Due to Ties in Ranking (FTIE)	Abstract	Pomes	FORTRAN
Friedman Two-Way Analysis of Variance Statistic (FTWOAV)	Abstract	Pomes	FORTRAN
Mann-Whitney U-Test (FUTEST)	Abstract	Pomes	FORTRAN
Kendall Coefficient of Concordance (FWTEST)	Abstract	Pomes	FORTRAN
Normal Distribution (NDTR)	Abstract	Pomes	FORTRAN
Matrix Printer (MATPRT)	Abstract	Pomes	FORTRAN
NONPARAS	Abstract	Pomes	FORTRAN
Population Pyramid (FPOPPYR)	Abstract	Garside	FORTRAN
Yule's Q (FYULEQ)	Abstract	Garside	FORTRAN
Yule's Q (IYULEQ)	Abstract	Garside	IITRAN

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12 ✓	Difference between Means while you wait	Abstract	Garside	CALCTRAN
13 ✓	Mean and Standard Deviation while you wait	Abstract	Garside	CALCTRAN
14	Small Scale Cross Tabulation.	Abstract	Garside	FORTRAN IV
15	Four Variable Yules Q Statistic (Yule16)	Abstract	Garside	IITRAN
16	Three Variable Yules Q Statistic (Yule8)	Abstract	Garside	IITRAN
17	NORC DATA DECK	Abstract	Garside	INTEGERS 0-9
18	Small Scale 3 Variable cross tabs (3TABS)	Abstract	Garside	FORTRAN IV
19	Survey Percent Distributions (Percent)	Abstract	Garside	FORTRAN IV
20	Population Dynamics I	Abstract	Pomes	FORTRAN IV
21	Table Printer for Population Dynamics I	Abstract	Pomes	FORTRAN IV
22	RECODER	Abstract	Pomes	FORTRAN IV
23	SUBROUTINE PUNTAP (Output for a vector or matrix of values)	Abstract	Pomes	FORTRAN IV

PSYCHOLOGY INDEX

<u>umber</u>	<u>Name</u>	<u>Type</u>	<u>Author</u>	<u>Language</u>
1	ANXSDES (Analysis of Variance)	Abstract	Ross	IITRAN
2	CORCOF (Pearson Product Moment Correlation Coefficient)	Abstract	Ross	IITRAN
3	LEASTSQ	Abstract	Ross	IITRAN
4	PACANXXZ (Factorial Analysis of Variance)	Abstract	Ross	IITRAN
5				
6	Pattern Noise	Abstract	Pomes & Pitts	FORTRAN
7	Elementary Parametric Statistics Package	Abstract	Pitts	FORTRAN
8	Basic: Measures and Pitts Central Tendency	Abstract	Pomes & Pitts	FORTRAN
9	Select: Creation of subsets from original data	Abstract	Pomes & Pitts	FORTRAN
10	Tests for normal distribution	Abstract	Pomes & Pitts	FORTRAN
11	Histogram	Abstract	Ebeling	FORTRAN
12	Correlation	Abstract	Pomes & Pitts	FORTRAN
13	Regression	Abstract	Pomes & Pitts	FORTRAN
14	Scattergram	Abstract	Pomes & Pitts	FORTRAN
15	t-test	Abstract	Pomes & Pitts	FORTRAN
16	Line plot	Abstract	Pomes & Pitts	FORTRAN
17	Matrix printer	Abstract	Pomes & Pitts	FORTRAN

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<u>Number</u>	<u>Name</u>	<u>Type</u>	<u>Arthur</u>	<u>Language</u>
1	Teachers Grading Program	Abstract	Ebeling	FORTRAN
2	Measures of Central Tendency: Teachers Grading Program	Abstract	Ebeling	FORTRAN
3	Standardized Scores: Teachers Grading Program	Abstract	Ebeling	FORTRAN
4	Histogram: Teachers Grading Program	Abstract	Ebeling	FORTRAN
5	Item Analysis by Quartile Ranking: Teachers Grading Program	Abstract	Ebeling	FORTRAN
6	Individual Student Analysis by Item Categorization: Teachers Grading Program	Abstract	Ebeling	FORTRAN

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

INSTITUTION AND ADDRESS City Colleges of Chicago		REGIONAL CENTER Illinois Institute of Technology		PROJECT DIRECTOR/COORDINATOR Dr. Henry Moughamian		GRANT NUMBER GJ 282	
REPORTING PERIOD 1969-1970		NO. OF TERMS IN ACADEMIC YEAR 2		DATE OF THIS REPORT May 1, 1970			

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

COLLEGE/UNIVERSITY: ☐ INDIVIDUAL ☒ SUMMARY
SECONDARY SCHOOL: ☐ INDIVIDUAL ☐ SUMMARY

(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE			(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY			(4) NUMBER OF FACULTY MEMBERS		(5) NUMBER OF RUNS	(7) CPU Time in Hours	(10) USE IN INSTRUCTION				
	Secondary School	College		Secondary School	College		Number in Discipline	Number in Regional Act.			Solving in Computer Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Prgs. and Language Development	
		Lower Division	Upper Division		Lower Division	Upper Division									
43 Programming															
Computer Science															
Mathematical and Physical Science		2,650		92			17	5	380	4.1	1.4	80			20
Biological Science															
Social Science and Education															
Business		2,280		660			21	7	684	8.0	0	70	10	20	
Arts and Humanities															
Engineering, Forestry, and Agriculture															
Unstructured															